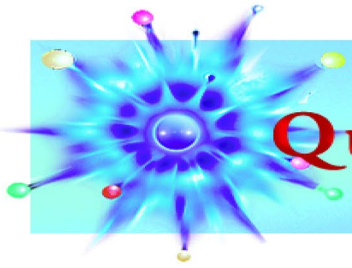


Report Global Cosmic Group



QuarkNet

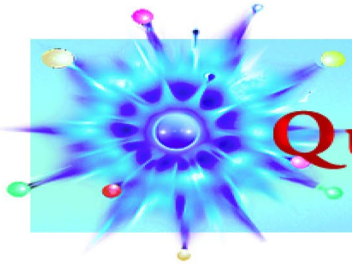
QuarkNet Cosmic Ray

Long-term collaboration with High Schools. Hundreds of detectors (CRMDs) Worldwide.

Cosmic Watches - QuarkNet built 48 (MIT design). **Every student in class** will have a detector. Activities: singles vs pair triggering; muon rates vs vertical separation; rate vs time; rate vs zenith angle; and rate at various locations (different floors). Prototyping usage this summer.

e-Lab statistics for 2022: 6,180 data uploads from 70 users in 6 countries; 7,630 analyses run; 318k logins; 2,107 Teacher accounts

Number of days each Analysis type was run: Flux (260); Lifetime (180); Performance (105); Shower (140); Time of Flight (115); **47k data files used**



QuarkNet

Special Projects

International Muon Week February 14–23, 2023: measure cosmic ray rate;
24 participants in 8 countries. Results at:

https://www.google.com/maps/d/u/0/edit?mid=1_b7XvLvx9ilJ9A-NJeDPvtP3pOAhgX0&ll=3.0643583764248064%2C0&z=2

and in a Global 3D plot:

<https://www.youtube.com/watch?v=DNAg1mYPKRU>



Special Cosmic Ray Projects:

Summer Workshops at Centers

Simple experiments with existing data for teachers without CRMDs

Jupyter Notebook code work for further analysis (e.g. upward muon search)

Storm tracking across the US Midwest

Search for the Moon's muon shadow

Cosmic activities integrated into Portfolio activities

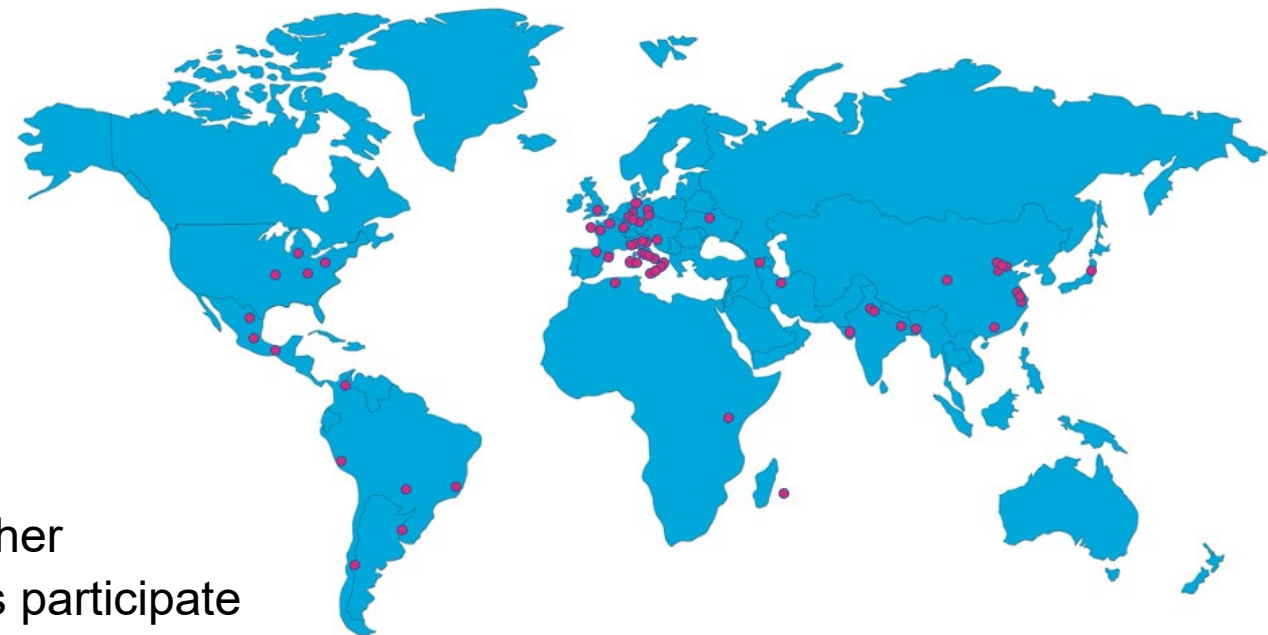
Pyramid – Muography at Chichen Itza – search for hidden chambers

QuarkNet plans to host data and develop event displays and analyses

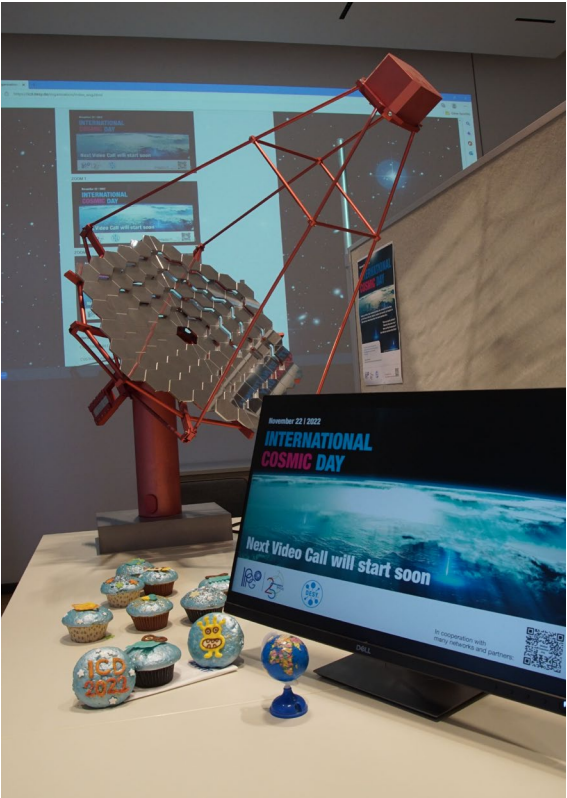
for the public

International Cosmic Day 2022

Topic: Investigating the particles from the cosmos



98 groups of students, teacher and scientist in 23 countries participate



© Heike Prokoph, DESY



© I.I.S.S. Aldo Moro Margherita

12 Video Calls throughout the day

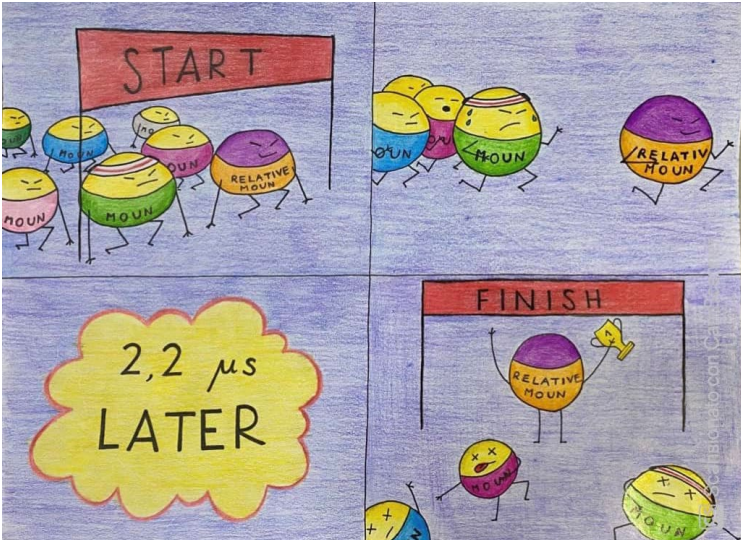


© Carolin Gnebner, DESY

Impressions from Selfie and Drawing Contest



© American School „Winamac
Community High School “



© Alice Borgazzi



© French School „Joliot Curie“



© Student from french School
„Joliot Curie“

Cosmic Lab at DESY, Zeuthen

Goals for 2023

- Redesign of CosMO III detectors
- Further development of Cosmic@Web
- Summer Camp Balloon Mission 2023
- CosmicWatch building for the first time
- Test of the Auger Masterclass at the ICD

19 in-person events, 1 mixed-mode event, 1 virtual event

3008 students

910 on-site/2098 remote

124 schools

109 on-site/15 remote



Distribution of OCRA ICD 2022 schools

Other activities:

- Participation in science festivals with laboratories for students of all ages
- In preparation: courses for teachers on cosmic rays with the use of the Cosmic Ray Cube (CRC)
- In preparation: production of several new CRCs

The latter two activities are part of the PNRR project CTA+



Pierre Auger masterclass



In May 2022 the first edition of the masterclass based on 10% of the released data of the Pierre Auger collaboration was organized

The masterclass took place in three Italian and three Portuguese institutes with about 80 students.

In March and April 2023 the second edition took place with participants from Portugal, Romania, Czech Republic, Italy and Algeria.

Since 2023 the masterclass is listed amongst those of **IPPOG**.

<https://physicsmasterclasses.org/>

INTERNATIONAL MASTERCLASSES 2023

> Registration Open <

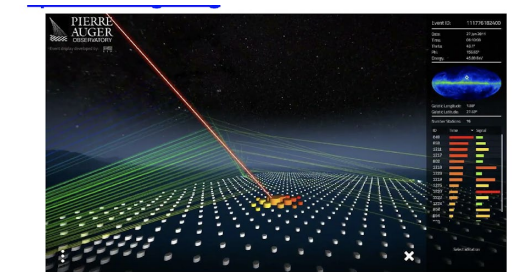
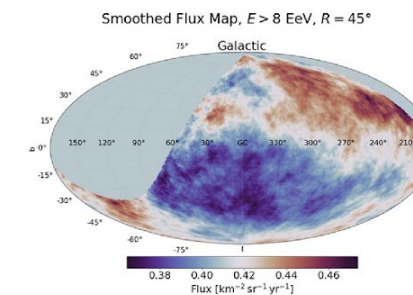
The masterclasses with the Pierre Auger Observatory in the IMC2023 will be held on these dates:

Europe - 18.03.2023

Europe - 24.03.2023

America - 28.03.2023

The registration is open for a maximum of 3 workshops per session, and the order of registry is



Auger Open Data
opendata.auger.org

- Analysis notebooks based on *python*, run on *kaggle*

Conclusion

Many projects are evolving in similar directions (discussion about balloon flights!)

Very interesting to exchange ideas and experiences

Every context is different and all cosmic ray projects are developed within the specific framework of the countries where they are developed!

Thank You